

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1-3. (Cancelled)

4. (Currently Amended) A laser irradiation apparatus comprising:

a laser oscillator;

a first means for expanding a laser beam emitted from the laser oscillator in a first direction;

a second means for condensing the laser beam in a second direction that is orthogonal to the first direction; and

a third means for ~~providing an object to be irradiated with the laser beam expanded in the first direction and condensed in the second direction with a laser beam irradiation surface and moving~~ [[the]]a laser beam irradiation surface in the second direction, relative to the laser beam expanded in the first direction and condensed in the second direction, over which an object to be irradiated having the laser beam irradiation surface is provided,

wherein the laser beam irradiation surface has a cylindrical shape curvature in a negative direction with respect to a direction in which the laser beam advances and in a direction parallel to the first direction,

~~wherein the cylindrical shape curvature is provided in a negative direction with respect to the direction at which the laser beam advances;~~

wherein ~~the second means is provided between the first means and the third means so that an aggregation of~~ focus positions of the laser beam passed-passing through the first means and the second means [[have]]has the cylindrical shape curvature in the negative direction with respect to the direction in which the laser beam advances and in the direction parallel to the first direction, and

wherein the laser beam irradiation surface has a side length on the order of 1 m.

5. (Currently Amended) A laser irradiation apparatus comprising:
- a laser oscillator;
 - a first means for expanding a laser beam emitted from the laser oscillator in a first direction;
 - a second means for condensing the laser beam in a second direction that is orthogonal to the first direction; and
 - a third means for ~~providing an object to be irradiated with the laser beam expanded in the first direction and condensed in the second direction with a laser beam irradiation surface and moving [[the]]~~ a laser beam irradiation surface in the second direction, relative to the laser beam expanded in the first direction and condensed in the second direction, over which an object to be irradiated having the laser beam irradiation surface is provided,
 - wherein the laser beam irradiation surface has a concave shape curvature in a negative direction with respect to a direction in which the laser beam advances and in a direction parallel to the first direction,
 - wherein radius of the curvature with respect to a certain focal length of a ~~lens or start of condenser~~ condenser lens falls within a range of the following two equations:
$$y = 2539.3 \ln(x) - 21447;$$
$$y = 1666.7 \ln(x) - 13098,$$
where y (mm) is focal length of the condenser lens, x (mm) is the radius of the curvature,
 - ~~wherein the concave shape curvature is provided in a negative direction with respect to the direction at which the laser beam advances,~~
 - wherein ~~the second means is provided between the first means and the third means so that an aggregation of~~ focus positions of the laser beam passed-passing through the first means and the second means [[have]] has the concave shape curvature in the negative direction with respect to the direction in which the laser beam advances and in the direction parallel to the first direction, and
 - wherein the laser beam irradiation surface has a side length on the order of 1 m.
6. (Currently Amended) A laser irradiation apparatus comprising:
- a laser oscillator;

a first means for expanding a laser beam emitted from the laser oscillator in a first direction;

a second means for condensing the laser beam in a second direction that is orthogonal to the first direction; and

a third means for ~~providing an object to be irradiated with the laser beam expanded in the first direction and condensed in the second direction with a laser beam irradiation surface and moving~~ [[the]]a laser beam irradiation surface in the second direction, relative to the laser beam expanded in the first direction and condensed in the second direction, over which an object to be irradiated having the laser beam irradiation surface is provided,

wherein the laser beam irradiation surface has a concave shape curvature in a negative direction with respect to a direction in which the laser beam advances and in a direction parallel to the first direction,

~~wherein the concave shape curvature is provided in a negative direction with respect to the direction at which the laser beam advances,~~

wherein ~~the second means is provided between the first means and the third means so that an aggregation of~~ focus positions of the laser beam passed-passing through the first means and the second means [[have]]has the concave shape curvature in the negative direction with respect to the direction in which the laser beam advances and in the direction parallel to the first direction, and

wherein the laser beam irradiation surface has a side length on the order of 1 m.

7. (Original) A laser irradiation apparatus according to claim 4, wherein the first means contains a cylindrical lens array or a cylindrical lens.

8. (Original) A laser irradiation apparatus according to claim 5, wherein the first means contains a cylindrical lens array or a cylindrical lens.

9. (Original) A laser irradiation apparatus according to claim 6, wherein the first means contains a cylindrical lens array or a cylindrical lens.

10. (Original) A laser irradiation apparatus according to claim 4, wherein the second means contains a cylindrical lens array or a cylindrical lens.

11. (Original) A laser irradiation apparatus according to claim 5, wherein the second means contains a cylindrical lens array or a cylindrical lens.

12. (Original) A laser irradiation apparatus according to claim 6, wherein the second means contains a cylindrical lens array or a cylindrical lens.

13. (Previously Presented) A laser irradiation apparatus according to claim 4, wherein the laser oscillator is an excimer laser, a YAG laser, a YVO₄ laser, a YLF laser, a YAlO₃ laser, or a glass laser.

14. (Previously Presented) A laser irradiation apparatus according to claim 5, wherein the laser oscillator is an excimer laser, a YAG laser, a YVO₄ laser, a YLF laser, a YAlO₃ laser, or a glass laser.

15. (Previously Presented) A laser irradiation apparatus according to claim 6, wherein the laser oscillator is an excimer laser, a YAG laser, a YVO₄ laser, a YLF laser, a YAlO₃ laser, or a glass laser.

16-39. (Cancelled)

40. (Currently Amended) A laser irradiation apparatus comprising:
a laser oscillator capable of emitting a laser beam;
a beam expander;
a cylindrical lens; and
a stage,
wherein the beam expander expands the laser beam in a first direction,
wherein the cylindrical lens condenses the laser beam in a second direction that is orthogonal to the first direction,
wherein ~~the stage provides~~ an object to be irradiated with the laser beam expanded in the first direction and condensed in the second direction ~~[[with]]~~having a laser beam irradiation surface is provided over the stage,

wherein the stage is capable of moving the laser beam irradiation surface in the second direction relative to the laser beam,

wherein the laser beam irradiation surface has a cylindrical shape curvature in a negative direction with respect to a direction in which the laser beam advances and in a direction parallel to the first direction,

~~wherein the cylindrical shape curvature is provided in a negative direction with respect to the direction at which the laser beam advances,~~

~~wherein the cylindrical lens is provided between the beam expander and the stage so that an aggregation of focus positions of the laser beam passed passing through the beam expander and the cylindrical lens [[have]]has the cylindrical shape curvature in the negative direction with respect to the direction in which the laser beam advances and in the direction parallel to the first direction,~~ and

wherein the laser beam irradiation surface has a side length on the order of 1 m.

41. (Currently Amended) A laser irradiation apparatus comprising:

a laser oscillator capable of emitting a laser beam;

a beam expander;

a cylindrical lens; and

a stage,

wherein the beam expander expands the laser beam in a first direction,

wherein the cylindrical lens condenses the laser beam in a second direction that is orthogonal to the first direction,

wherein ~~the stage provides~~ an object to be irradiated with the laser beam expanded in the first direction and condensed in the second direction ~~[[with]]~~having a laser beam irradiation surface is provided over the stage,

wherein the stage is capable of moving the laser beam irradiation surface in the second direction relative to the laser beam,

wherein the laser beam irradiation surface has a concave shape curvature in a negative direction with respect to a direction in which the laser beam advances and in a direction parallel to the first direction,

~~wherein the concave shape curvature is provided in a negative direction with respect to the direction at which the laser beam advances,~~

wherein ~~the cylindrical lens is provided between the beam expander and the stage so that an aggregation of focus positions of the laser beam passed passing~~ through the beam expander and the cylindrical lens ~~[[have]]~~has the concave shape curvature in the negative direction with respect to the direction in which the laser beam advances and in the direction parallel to the first direction,

wherein radius of the concave shape curvature with respect to a certain focal length of a condenser lens falls within a range of the following two equations:

$$y = 2539.3 \ln(x) - 21447;$$

$$y = 1666.7 \ln(x) - 13098,$$

where y (mm) is focal length of the condenser lens, x (mm) is the radius of the curvature, and

wherein the laser beam irradiation surface has a side length on the order of 1 m.

42. (Currently Amended) A laser irradiation apparatus comprising:

a laser oscillator capable of emitting a laser beam;

a beam expander;

a cylindrical lens; and

a stage,

wherein the beam expander expands the laser beam in a first direction,

wherein the cylindrical lens condenses the laser beam in a second direction that is orthogonal to the first direction,

wherein ~~the stage provides~~ an object to be irradiated with the laser beam expanded in the first direction and condensed in the second direction ~~[[with]]~~having a laser beam irradiation surface is provided over the stage,

wherein the stage is capable of moving the laser beam irradiation surface in the second direction relative to the laser beam,

wherein the laser beam irradiation surface has a concave shape curvature in a negative direction with respect to a direction in which the laser beam advances and in a direction parallel to the first direction,

~~wherein the concave shape curvature is provided in a negative direction with respect to the direction at which the laser beam advances,~~

~~wherein the cylindrical lens is provided between the beam expander and the stage so that an aggregation of focus positions of the laser beam passed passing through the beam expander and the cylindrical lens~~ [[have]]has the concave shape curvature in the negative direction with respect to the direction in which the laser beam advances and in the direction parallel to the first direction, and

wherein the laser beam irradiation surface has a side length on the order of 1 m.

43. (Previously Presented) A laser irradiation apparatus according to claim 40, wherein the beam expander contains a cylindrical lens array.

44. (Previously Presented) A laser irradiation apparatus according to claim 41, wherein the beam expander contains a cylindrical lens array.

45. (Previously Presented) A laser irradiation apparatus according to claim 42, wherein the beam expander contains a cylindrical lens array.

46. (Previously Presented) A laser irradiation apparatus according to claim 40, wherein the laser oscillator is an excimer laser, a YAG laser, a YVO₄ laser, a YLF laser, a YAlO₃ laser, or a glass laser.

47. (Previously Presented) A laser irradiation apparatus according to claim 41, wherein the laser oscillator is an excimer laser, a YAG laser, a YVO₄ laser, a YLF laser, a YAlO₃ laser, or a glass laser.

48. (Previously Presented) A laser irradiation apparatus according to claim 42, wherein the laser oscillator is an excimer laser, a YAG laser, a YVO₄ laser, a YLF laser, a YAlO₃ laser, or a glass laser.

49-54. (Cancelled)

55. (Previously Presented) A laser irradiation apparatus according to claim 4, wherein the laser oscillator is a continuous oscillation type laser oscillator.

56. (Previously Presented) A laser irradiation apparatus according to claim 5, wherein the laser oscillator is a continuous oscillation type laser oscillator.

57. (Previously Presented) A laser irradiation apparatus according to claim 6, wherein the laser oscillator is a continuous oscillation type laser oscillator.

58. (Previously Presented) A laser irradiation apparatus according to claim 40, wherein the laser oscillator is a continuous oscillation type laser oscillator.

59. (Previously Presented) A laser irradiation apparatus according to claim 41, wherein the laser oscillator is a continuous oscillation type laser oscillator.

60. (Previously Presented) A laser irradiation apparatus according to claim 42, wherein the laser oscillator is a continuous oscillation type laser oscillator.

61. (Previously Presented) A laser irradiation apparatus according to claim 4, further comprising a cylindrical lens array having planoconcave lenses.

62. (Previously Presented) A laser irradiation apparatus according to claim 5, further comprising a cylindrical lens array having planoconcave lenses.

63. (Previously Presented) A laser irradiation apparatus according to claim 6, further comprising a cylindrical lens array having planoconcave lenses.

64. (Currently Amended) A laser irradiation apparatus according to claim 40, ~~wherein the laser oscillator is a continuous oscillation type laser oscillator.~~ further comprising a cylindrical lens array having planoconcave lenses.

65. (Previously Presented) A laser irradiation apparatus according to claim 41, further comprising a cylindrical lens array having planoconcave lenses.

66. (Previously Presented) A laser irradiation apparatus according to claim 42, further comprising a cylindrical lens array having planoconcave lenses.